



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/695,620	10/27/2003	Alexander Kadyshevitch	PDC/6967.PO2	3908

7590 09/24/2007  
PATENT COUNSEL  
APPLIED MATERIALS, INC.  
Legal Affairs Department  
P.O. BOX 450A  
Santa Clara, CA 95052

EXAMINER
----------

VANORE, DAVID A

ART UNIT	PAPER NUMBER
----------	--------------

2881

MAIL DATE	DELIVERY MODE
-----------	---------------

09/24/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/695,620

Applicant(s)

KADYSHEVITCH ET AL.

Examiner

David A. Vanore

Art Unit

2881

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 27 August 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-18 and 21-34 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-18 and 21-34 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                        | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date. _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments with respect to claims 1-2, 4-18, and 21-34 have been considered but are moot in view of the new ground(s) of rejection.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-2, 4-18, and 21-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada et al. (USPN 6,768,324).

5. Regarding claims 1 and 18, Yamada et al. teaches a device and method for testing a sample comprising directing a beam of charged particles from a source (Producing beam 61 for example) towards a sample having at least partially conductive

first and second layers and contact openings therein (Fig. 16a, Items 41 and 42), the particle beam being along an axis which deviates substantially in angle from a normal to a surface of the sample (Fig. 16A), irradiating one or more contact opening Item 43), a current measuring device for measuring current flowing through a specimen (Item 9), a secondary electron detector to measure secondary electrons (Item 33), a controller which creates a map of the sample from the specimen current flowing through the sample and secondary electrons detected (Item 10 and Fig. 55 for creating a 3D mapped image of the scanned sample), a network which necessarily includes a workstation such that when analysis of a sample is completed a determination of the cause of defect is made and an instruction for regulating an etching apparatus is sent to a manufacturing device (Col. 19). Further, Yamada et al. shows that such analysis includes assessment of the contact holes and wafers which are classified to determine defects, or anomalies such that corrective action may be carried out to correct a processing device. (Note Col. 20).

6. Yamada et al. however fails to explicitly teach the orientation of a sample relative to a beam axis that is at an angle, this angle being greater than an arctangent of an aspect ratio of the contact openings where the aspect ratio is a ratio of the depth to the diameter of an individual contact opening.

7. It is of note that in Fig. 53 and Fig. 54, along with their related discussion in the specification of Yamada et al. that a means for tilting the sample relative to the beam is included and that such tilting is carried out to investigate the degree of taper which may be present in a contact opening.

8. It would have been obvious to one having ordinary skill in the art at the time the invention was made to tilt the sample relative to the beam axis through any desired angle, including an angle greater than an arctangent of an aspect ratio of a contact opening, because the Yamada et al. reference indicates that such tilting is useful for investigating the sidewall structure of a contact opening and that such tilting enables investigation of the interior of the contact opening. Having this teaching at hand, one of ordinary skill would then know to apply it by tilting a sample having contact openings under test as required, through any desired range of angles to enable investigation of such openings.

9. Regarding claim 2, the map created utilizes the compensation current indicating the contour information determined by analyzing current flowing through the sample and displaying said information with the data indicated the openings or surface of the sample where the surface information is determined by secondary electron detection (Col. 20 under the heading "Map Display")

10. Regarding claims 4 and 21, the map and analysis indicate at least a width, or diameter, of a contact opening (Col. 20 under the heading Quality Determination by Map Display and Process Evaluation).

11. Regarding claims 5-8 and 22-25, the map and the analysis of said map indicate variations of at least contact hole size (Col. 19 Lines 9-12) where such determination is made by comparison between first and second samples (Col. 19 Lines 25-40) such that

corrective action such as regulation of an etching apparatus is made in response to analysis of said map (Col. 19 Lines 45-48).

12. Regarding claims 9 and 26, since the map indicates the diameter distribution of contact holes (Col. 21 Lines 25-28), including the compensation current which indicates the size and location of a contact hole bottom and including the opening portion of a contact hole, which lies on the surface of the sample, the map and the analysis thereof indicates an alignment between contact openings in a second layer and a structure in a second layer such as that illustrated in Fig. 59A-B and Fig. 60A-B, where Item 242 is an exemplary second structure in the first layer.

13. Regarding claims 10 and 27, the sample is a semiconductor wafer.

14. Regarding claims 11-12 and 28-29, the process and device of Yamada et al. tests the entire wafer including all locations thereon and is capable of scanning different portions or test regions (Col. 44 Lines 1-9).

15. Regarding claims 13-14 and 30-31, the contact openings comprise holes or grooves (trenches), note Col. 42 Lines 50-61.

16. Regarding claims 15 and 32, the beam may be angled such that more beam strikes a side wall than a bottom of a contact opening (Fig. 54).

17. Regarding claims 16 and 33, the analysis and controller performing such analysis may assess the presence of a residue (Fig. 19A-B), note Item 71.

18. Regarding claims 17 and 34, Yamada et al. teaches that the substrate is irradiated at a first lower energy beam, and then subsequently at higher energy to allow

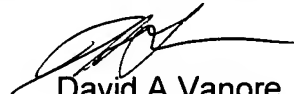
the electron beam to penetrate an insulating layer, thereby precharging the substrate negatively and allowing compensation current to be measured. Note Col. 40.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David A. Vanore whose telephone number is (571) 272-2483. The examiner can normally be reached on M-F 7:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (571) 272-2293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
David A Vanore  
Primary Examiner  
Art Unit 2881

dav